Three observation of interspecific mating attempts by males of the Meadow Brown (*Maniola jurtina* (Linnaeus, 1758)) in the wild (Lepidoptera, Nymphalidae: Satyrinae, Heliconiinae)

Lukáš Spitzer, Jiří Beneš, Pavel Vrba and Marek Zlatník

Lukáš Spitzer, MSc., Faculty of Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic; spitzerl@yahoo.com. – Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic. – Correspondence: Regional Museum Vsetin, Horní náměstí 2, CZ-755 01 Vsetín, Czech Republic.

Jiří Beneš, Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic; benesjir@seznam.cz.

Pavel Vrba, Faculty of Sciences, University of South Bohemia, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic, vrba_pavel@centrum.cz. – Department of Ecology and Conservation, Institute of Entomology, Czech Academy of Sciences, Branišovská 31, CZ-370 05 České Budějovice, Czech Republic.

Marek Zlatník, Kollárova 116, CZ-506 01 Jičín, Czech Republic, mz116@seznam.cz.

Abstract: We report three observations of interspecific mating events between males of *Maniola jurtina* (Nymphalidae: Satyrinae) and females of three butterfly species, *Aphantopus hyperanthus* and *Erebia aethiops* (both Nymphalidae: Satyrinae) and *Argynnis aglaja* (Nymphalidae: Heliconiinae), all under natural conditions. While the pairings with Satyrinae females happened lately in *M. jurtina* flight period, and could be attributed to mate recognition mistakes, the pairing with *A. aglaja* was observed relatively early in *M. jurtina* flight, and we speculate that males reacted to supraoptimal visual stimulus.

Key words: interspecific copulation, mate recognition mistakes, *Argynnis, Aphantopus, Erebia,* Czech Republic.

Drei Fälle von interspezifischen Paarungsversuchen von Männchen von *Maniola jurtina* (Linnaeus, 1758) im Freiland (Lepidoptera, Nymphalidae: Satyrinae, Heliconiinae)

Zusammenfassung: Drei Beobachtungen von interspezifischen Paarungen zwischen Männchen von *Maniola jurtina* (Nymphalidae: Satyrinae) und Weibchen von drei verschiedenen anderen Arten (*Aphantopus hyperanthus* und *Erebia aethiops,* beides ebenfalls Nymphalinae: Satyrinae, sowie *Argynnis aglaja,* Nymphalidae: Heliconiinae) werden vorgestellt. Während die Paarungen mit den Satyrinenweibchen spät in der Flugzeit von *M. jurtina* stattfanden und als Fehler in der Arterkennung der Männchen mangels arteigener Weibchen interpretiert werden können, fanden die Paarungen mit *Argynnis aglaja* zu Beginn der Flugzeit von *M. jurtina* statt, und wir vermuten, daß es dabei um überoptimale optische Anreize ging.

Introduction

Although hybridisation between butterflies occurs rather commonly in nature, as summarized by a recent review by Descimon & Mallet (2009), the mating events are rather rarely observed and reported. Observations of *in copula* pairs seem to be more frequent among phylogenetically and/or morphologically close species, such as congeneric pairings between burnet moths (Zygaenidae) (e.g., Skala 1913, Janicke 1989, Young et al. 2007), hairstreaks (Edmonds 1979), nymphalids (Greeney et al. 2006), swallowtails (Hereau & Scriber 2003), apollo butterflies (Descimon et al. 1989, cf. Descimon & Mallet 2009), or among skippers (Hesperiidae) (Blanchemain 1999). Besides of these pairings among closely related species, there exist observations of pairings between representatives of different, and distantly related, families, such as between ♂ of the arctiid moth *Amata phegea* (Linnaeus, 1758) and ♀ of the burnet moth *Zygaena filipendulae* (Linnaeus, 1758) (Novotný et al. 2009), or – again – ♀ *Z. filipendulae* and ♂ of the arctiid moth *Tyria jacobaeae* (Linnaeus, 1758) (Williams 1914, Tremewan 2005). These rare cases are attributable to mate recognition mistakes, as the moths in question share diurnal habit and mimic each other (*A. phegea* and *Zygaena* spp.), or display similar wing colors (*T. jacobaeae* and *Zygaena* spp.). The rarest, and most difficult to interpret, are observations of *in copula* pairs among unrelated species differing in body size and wing shape and pattern, such as that between ♂ *Lycaena helloides* (Boisduval, 1852) and fresh ♀ *Vanessa* (= *Cynthia*) *annabella* (Field, 1971) (Shapiro 1973).

Here, we report three observations of interspecific pairings of the Meadow Brown ♂♂ (*Maniola jurtina* Linnaeus, 1758) with ♀♀ of three species of nymphalid butterflies, two rather related – *Aphantopus hyperanthus* (Linnaeus, 1758) and *Erebia aethiops* (Esper, 1777) –, belonging to the subfamily Satyrinae just like *M. jurtina* itself, and one rather unrelated species of the subfamily Heliconiinae – *Argynnis aglaja* (Linnaeus, 1758). All three observations originated from the Czech Republic, year 2009.

Material

- Moravia mer., Kudějov, Kamenný vrch reserve (7066, 48°57′58″N, 16°45′8″E), 330 m alt., 9. viii. 2009, 14:20 h CEST; ♂ *Maniola jurtina* & ♀ *Aphantopus hyperanthus*, Marek Zlatník observ. et det., Jiří Beneš revid. Observed for ca. 100 min, and not until termination.

The habitat was a south-oriented calcareous grassland. Both species are abundant at the locality, but in the observation day, in late season for both species, there were about 20 *M. jurtina* and 2 *A. hyperanthus* individuals present in close vicinity of the near mating pair, and both the ♂ and the ♀ were quite heavily worn, presumably old, individuals (Fig. 1).

- Bohemia mer., Studánky nr. Vyšší Brod (7451, 48°35′42″N, 14°20′32″E), 670 m alt., 26. vii. 2009, 14:40 h CEST; ♂ *Maniola jurtina* & ♀ *Erebia aethiops*,

© Entomologischer Verein Apollo e. V., Frankfurt am Main

Pavel Vrba observ. et det. Observed for ca. 10 min, the pair then flew away, still *in copula*.

The habitat was a dry woodland mantle, with dozens *M. jurtina* individuals (both sexes) and three *E. aethiops* individuals (2 ♂♂, 1 ♀). While the *M. jurtina* ♂ was quite worn, the *E. aethiops* ♀ appeared fresh (Fig. 2).

- Moravia or., Velké Karlovice, part Bzové (6675, 49°22'16"N, 18°15'47"E), 575 m alt., 12. vii. 2009, 14:20 h CEST; ♂ *Maniola jurtina* & ♀ *Argynnis aglaja*, Jiří Beneš & Lukáš Spitzer observ. et det. Observed for ca. 15 min.

The habitat was south-oriented mountain pasture. The pairing took place under sunny weather, the pair alternated sitting on vegetation with short flyovers, the ♀ actively carried the pair. *M. jurtina* was abundant (hundreds of individuals), *A. aglaja* was present in dozens of individuals. Both individuals appeared rather fresh.

Discussion and conclusion

We observed 3 ♂♂ of *M. jurtina* pairing with ♀♀ of 3 different species of the family Nymphalidae. The pairings with same-subfamily ♀♀, *A. hyperanthus* and *E. aethiops*, are attributable to simple mate-recognition mistakes (Descimon & Mallet 2009), as both *A. hyperanthus* and *E. aethiops* ♀♀ are visually quite similar to ♀♀ of *M. jurtina*. ♂♂ of *M. jurtina* seek for ♀♀ by slow patrolling flights over herbaceous vegetation, presumably using visual orientation. In addition, both sexes usually show aggregated behavior, which facilitates meeting of sexes (Brakefield 1982). The pairing with *A. aglaja* (subfamily Heliconiinae) is more intriguing, as the two species are phylogenetically distant, and *A. aglaja* differs from *M. jurtina* slightly in forewing length (*M. jurtina*: 23–26 mm, *A. aglaja*: 23–32 mm) but considerably in wing area (much larger in *A. aglaja*), coloration (brown with rusty spots in *M. jurtina*, brightly reddish with black checker in *A. aglaja*), and pearly pattern on ventral hind wings (never present in subfamily Satyrinae).

Given the wing wears of observed individuals, and the general rule (e.g., Rutowski 1998) that butterfly ♂♂ maximize their fitness by preferential mating with fresh ♀♀, whereas old or unmated ♀♀ may actively solicitate mating, we can speculate on circumstances of the three mistakes.

The first Satyrinae case was observed rather lately in *M. jurtina* ♂♂ flight period, which usually begins in late June/early July, and very lately for an *A. hyperanthus*, whose flight usually begins earlier than that of *M. jurtina* (Beneš et al. 2002). It is hence possible that there were not enough *M. jurtina* ♀♀ present, and in the same time, the worn *A. hyperanthus* ♀ could had been less inclined to avoid mating, as old and/or unmated *A. hyperanthus* ♀♀ are known to actively solicit copulation (Wiklund 1982). The pairing with *E. aethiops* ♀ also occurred lately in *M. jurtina* flight, when there was possible shortage of receptive *M. jurtina* ♀♀. The mating with *A. aglaja* ♀ is somehow more intriguing. Receptive *A. aglaja* ♀♀ wait for patrolling ♂♂ hidden in vegetation (Zimmermann et al. 2009). Speculatively, the *M. jurtina* ♂ could have responded to such a ♀ as to supernormal stimulus, a reaction which is well established in many taxa (e.g., Krebs & Davies 1997), but rarely considered in butterflies (e.g., Tinbergen et al. 1942).

Acknowledgements

Wed thank Martin Konvička for text corrections, and acknowledge financial support by the Czech Ministry of Education (MSM 6007665801, LC6073) and Czech Union for Nature Conservation (01010608).

Fig. 1: Photograph of *M. jurtina* with *A. hyperanthus* copulation. **Fig. 2:** Photograph of *M. jurtina* with *E. aethiops* copulation.

© Entomologischer Verein Apollo e. V., Frankfurt am Main

References

Beneš, J., Konvička, M., Dvořák, J., Fric, Z., Havelda, Z., Pavlíčko, A., Vrabec, V., & Z. Wiedenhoffer [eds.] (2002): Butterflies of the Czech Republic: Distribution and conservation I, II. – Praha (SOM), 857 pp. [in Czech with English summary].

Blanchemain, J. (1999): Accouplements interspécifiques chez *Hesperia comma* L., 1758 (Lepidoptera Hesperiidae). – Alexanor, Paris, **20:** 447.

Brakefield, P. M. (1982): Ecological studies on the butterfly *Maniola jurtina* in Britain. I. Adult behaviour, microdistribution and dispersal. – Journal of Animal Ecology, London, **51:** 713–726.

Descimon, H., & Mallet, J. (2009): Bad species. – Pp. 219–249 *in:* Settele, J., Shreeve, T. G., Konvicka, M., & van Dyck, H. [eds.], Ecology of butterflies in Europe. – Cambridge (Cambridge University Press), 513 pp.

——, Genty, F., & Vesco, J.-P. (1989): L'hybridation naturelle entre *Parnassius apollo* (L.) et *P. phoebus* (F.) dans les alpes du sud (Lepidoptera: Papilionidae). – Annales de la Société Entomologique de France, Paris, **25:** 209–234 [in French with English summary].

Edmonds, W. H. (1979): Special notes on Ontario butterflies. Interspecific mating – *Satyrium edwardsii* (male) × *S. acadica* (female). – Toronto Entomologists' Association Occasional Publication, Toronto, **10:** 18.

Greeney, H. F., Dameron, W., & Brodkin, H. (2006): An interspecific mating attempt between a male *Siproeta epaphus* Latreille and a female *Anartia amathea* Linnaeus (Lepidoptera: Nymphalidae). – Journal of Research on the Lepidoptera, Beverly Hills, **39:** 88–89.

Hereau, H., & Scriber, J. M. (2003): Interspecific copulation of a dark morph *Papilio glaucus* female and a male *P. polyxenes* (Papilionidae): Observation and significance. – Journal of the Lepidopterists' Society, Los Angeles, **57:** 71–74.

Janicke, M. (1989): Versuch einer Nachzucht einer Mischpaarung von *Zygaena filipendulae* L. mit *Burgeffia ephialtes peucedani* Esp. aus dem Freiland (Lep., Zygaenidae). – Entomologische Nachrichten und Berichte, Dresden, **33:** 234.

Krebs, J. R., & Davies, N. B. [eds.] (1997): Behavioural ecology: an evolutionary approach. 4th edition. – Oxford (Blackwell), 468 pp.

Novotný, D., Beneš, J., & Konvička, M. (2009): Repeated observation of interfamilial "mating" between males of arctiid moth *Amata phegea* and females of the burnet moth *Zygaena filipendulae* (Lepidoptera: Arctiidae and Zygaenidae). – Nachrichten des Entomologischen Vereins Apollo, Frankfurt am Main, **30** (1/2): 81–82.

Rutowski, R. L. (1998): Mating strategies of butterflies. – Scientific American, New York, **279:** 64–69.

Shapiro, A. M. (1973): An attempted interfamilial mating (Lycaenidae, Nymphalidae). – Journal of the Lepidopterists' Society, New Haven, **27:** 159.

Skala, H. (1913): Die Lepidopterenfauna Mährens, II. Teil. – Verhandlungen des Naturforschenden Vereins Brünn, **51:** 115–377.

Tinbergen, N., Meeuse, B. J. D., Boerema, K., & Varosieau, W. W. (1942): Die Balz des Samtfalters, *Eumenis* (= *Satyrus*) *semele* (L.). – Zeitschrift für Tierpsychologie, Berlin, **5:** 182–226.

Tremewan, W. G. (2005): An interspecific pairing between *Tyria jacobaeae* (Linnaeus, 1758) (Lepidoptera: Arctiidae) and *Zygaena filipendulae* (Linnaeus, 1758) (Lepidoptera: Zygaenidae). – Entomologist's Gazette, Iver, **56:** 223–224.

Wiklund, C. (1982): Behavioral shift from courtship solicitation to mate avoidance in female ringlet butterflies (*Aphantopus hyperanthus*) after copulation. – Animal Behaviour, **30:** 790–793.

Williams, B. S. (1914): An irregular pairing in nature. – The Entomologist's Record and Journal of Variation, Bishops Stortford, **26:** 185.

Young, M. R., Grounds, S., & Jones, E. A. (2007): Hybrid matings between *Zygaena filipendulae* (Linnaeus, 1758) and *Z. viciae* (Denis & Schiffermüller, 1775) (Lepidoptera: Zygaenidae) in Scotland in 2006. – Entomologist's Gazette, Iver, **8:** 185–187.

Zimmermann, K., Konvička, M., Fric, Z., & Čiháková, V. (2009): Demography of a common butterfly on humid grasslands: *Argynnis aglaja* (Lepidoptera: Nymphalidae) studied by mark-recapture. – Polish Journal of Ecology, Łomianki, **57:** 715–727.

Received: 4. i. 2010

© Entomologischer Verein Apollo e. V., Frankfurt am Main, Oktober 2010 ISSN 0723-9912

© Entomologischer Verein Apollo e. V., Frankfurt am Main